MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

SUPPLEMENTARY EXAMINATION

TRIMESTER 1, 2015/2016

TSE3151 – SOFTWARE DESIGN
TSD2711 – SOFTWARE DESIGN

(All Sections/Groups)

17 NOV 2015
2.30 PM – 4.30 PM
(2 HOURS)

INSTRUCTIONS TO STUDENTS

1. The total number of pages for this examination paper is seven(7) pages including the cover page.

2. This examination paper contains a total of six(6) questions divided into two(2) different sections, Section A and Section B, respectively. Each section contains three(3) questions.

3. You are required to answer a total of four(4) questions. You must answer any two(2) questions from Section A and any two(2) questions from Section B.

4. Each question carries an equal score of 25 points. The total score for this examination paper is 100 points.

SECTION A

(Answer any two(2) questions in this section)

QUESTION A1

A1(a) Answer the following questions. You may provide appropriate examples in your answers.

(a1) Describe three(3) differences between functional and non-functional requirements.

(a2) Discuss the impacts or consequences of implicit and explicit software requirements to software design.

(a3) Explain by providing an example how an emergent requirement arises in software design.

[3 x 3 points = 9 points]

A1(b) Systems are designed based on different focus. Answer the following questions.

(b1) Describe by giving one(1) example of a system design where the focus is on different operating modes. Explain through your example.

(b2) "*Sometimes as a designer, we do not have the freedom to choose and provide the best design options to our customer.*" Provide an example where a case like this can happen.

[2 x 3 points = 6 points]

A1(c) Discuss the following issues in the context of how each term affects software design. You may provide appropriate examples in your answers.

(c1) Dominant features of the application.
(c2) Unrealistic requirements.
(c3) Implementation requirements.
(c4) Embedded systems.
(c5) Platform-based systems.

[5 x 2 points = 10 points]

Continue ..

QUESTION A2

A2(a) Answer the following questions. You may provide appropriate examples in your answers.

(a1) What do you understand by traceability in software requirement descriptions? Why does requirement traceability affect software design?

(a2) Why is it important to satisfy correctness in Software Requirements Specifications (SRS)?

(a3) Provide one(1) example that explains the occurrence of an inconsistent requirement description.

[3 x 3 points = 9 points]

A2(b) Consider the following two(2) principles in object-oriented software design: *abstraction* and *inheritance*.

(b1) What is the abstraction principle in the context of software design? Describe by giving an example how abstraction is implemented in object-oriented design.

(b2) What is the inheritance principle in the context of software design? Describe by giving an example why multiple inheritance is allowed but not encouraged in most major programming languages.

[2 x 3 points = 6 points]

A2(c) Discuss the following key issues and their impacts to the resulting software design. You are to provide at least one(1) example or impact for the implementation of each of the issues below. You may provide appropriate examples in your answers.

(c1) Activity Diagram (AD) in UML Design Notation.
(c2) Sequence Diagram (SD) in UML Design Notation.
(c3) The Interface-Segregation Principle (ISP) in object-oriented design.
(c4) Constructor function in object-oriented design.
(c5) Destructor function in object-oriented design.

[5 x 2 points = 10 points]

Continue ..

QUESTION A3

A3(a) Draw an example for each of the following Unified Modeling Language (UML) diagrams. For what purposes would you use them in your software design?

(a1) Class Diagram (CD) with two(2) derived classes.
(a2) Object diagram (OD) with three(3) derived instances
(a3) Composite-Structure Diagram (CSD)

[3 x 3 points = 9 points]

A3(b) Describe the principles in executing the following activities in object-oriented design. It means explain the steps you would do them.

(b1) Identification of Use-Cases.
(b2) Identification of State-Transitions.

[2 x 3 points = 6 points]

A3(c) Consider the following design architectures. Answer the questions appropriately.

(c1) When is it appropriate to implement the Event-Driven design architecture? Explain.

(c2) Provide one(1) advantage of the monolithic design architecture.

(c3) Explain how the distributed database architecture of Apache Cassandra works.

(c4) The Client-Server architecture may encounter problems when transaction volumes are very high and the system may crash. Explain how transaction servers help solve the problems of high concurrent connections in the Client-Server architectures.

(c5) Describe what you understand by the term "*Platform as a Service (PaaS)*" in software design.

[5 x 2 points = 10 points]

Continue ..

SECTION B

(Answer any two(2) questions in this section)

QUESTION B1

B1(a) Consider software design architectures. Answer the following questions.

(a1) Describe three(3) characteristics of the Data-Centric architecture.

(a2) Provide three(3) comparisons that explain the differences between the Peer-to-Peer (P2P) and Service-Oriented Architecture (SOA).

(a3) The Map-Reduce (MR) processing algorithm is used extensively in parallel and distributed software architectures. Explain how Map-Reduce works. You may provide suitable examples in your answers.

[3 x 3 points = 9 points]

B1(b) Consider the following procedural design patterns. Answer the following questions.

(b1) Explain the design solutions that the "*decorator design pattern*" and the "*facade design pattern*" provide. It means what design problems do the two(2) design patterns solve.

(b2) The "*accordion design pattern*" is one of the many structural design patterns provided under the Yahoo Design Pattern Library. Explain what the accordion design pattern solve. Where would you implement the accordion design pattern?

[2 x 3 points = 6 points]

B1(c) Discuss the following software systems and their implementations in terms of design. It means you must briefly explain what these systems are used for and how they work.

(c1) Hypertext Transport Protocol (HTTP) systems.
(c2) Distributed File Systems (DFS).
(c3) Logic-based systems (PROLOG).
(c4) Enterprise Java Beans (EJB) from Oracle Corporation.
(c5) Component Object Model (COM) from Microsoft Corporation.

[5 x 2 points = 10 points]

Continue ..

QUESTION B2

B2(a) Consider distributed and parallel designs of software applications. Answer the following questions.

(a1) Explain how the ***mutex*** and ***semaphore*** software constructs work in distributed and parallel designs of software applications.

(a2) In parallel computing, a ***barrier*** is a type of synchronization method. Describe how barriers are used in distributed and parallel designs of software applications.

(a3) In parallel programming, a ***monitor object*** design pattern is also a synchronization construct. How is the monitor different from the barrier in distributed and parallel designs of software applications?

[3 x 3 points = 9 points]

B2(b) Consider system designs for software and hardware interfaces.

(b1) Why is it that we must never purchase hardware from third parties if there are no software drivers provided to interface to our software application?

(b2) How does the Simplified Wrapper Interface Generator (SWIG) software help in interfacing components built using different programming languages?

[2 x 3 points = 6 points]

B2(c) Answer the following design questions.

(c1) Explain the difference between a conditional expression and a conditional branching.

(c2) What is the major difference between the ***(do .. while(expression) loop)*** and the ***(do .. until(expression) loop)***? In what circumstances would you use one over the other?

(c3) Explain the major difference between conditionals ***(if A then B elseif C .. elseif D .. elseif E else F)*** and ***(switch case A case B case C .. case else D).***

(c4) Describe three(3) characteristics of an optimization algorithm.

(c5) Explain the recursion algorithm and its impact on computer memory usage.

[5 x 2 points = 10 points]

Continue ..

QUESTION B3

B3(a) Explain what each of the following characteristics mean for good software design quality practices. You may provide suitable examples in your answers.

(a1) Maintainability in design.
(a2) Reliability in design.
(a3) Safety in design.

[3 x 3 points = 9 points]

B3(b) Discuss the challenges in software design for each of the following:

(b1) Data encryption, the levels and layers of access protection we need for our software and data.

(b2) The Internet of Things (IoT), that is, the interconnection of uniquely identifiable embedded computing devices on the existing internet infrastructure.

[2 x 3 points = 6 points]

B3(c) Answer the following software design questions. You may provide suitable examples in your answers.

(c1) ***"Drupal"*** is a free and open-source content-management framework. What does a framework mean in software design?

(c2) Why would you want to use an existing E-Commerce software framework against designing your own E-Commerce software from scratch? Explain.

(c3) It was said that the AJAX software framework was first showcased for its overwhelming success in the web-based *GoogleEarth* application. What is the AJAX framework? How does it work?

(c4) What do you understand by the software requirement that "*Allow user interaction to be interruptable and undoable*" for user interface (UI) design? You may explain using appropriate examples.

(c5) When a client requests that the software interface "*discloses information is a progressive fashion*", how would you address this requirement in your user interface (UI) design?

[5 x 2 points = 10 points]

End of Page